

ART. IX.—*Embankment above Prince's Bridge.*

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In bringing before the Society the subject of the embankment recently constructed along the south bank of the Yarra to the eastward of Prince's Bridge, it is due to myself to say, that I did not wait until it was made before giving my opinion of it, and the evils likely to result from its construction; but that immediately on hearing it was the intention of the Government to make such an embankment, I called the attention of the Honourable the Commissioner of Lands and Agriculture, as well as the City Council, to the danger of so doing.

In a letter lately published in the *Daily Telegraph*, signed "Yarra Floods," the writer states that the embankment is a step in the right direction, and that he hopes Mr. Smith will not frighten them before they are hurt. But, Sir, I think the members of this Society will agree with me, not only in the wisdom of the old axiom, "Prevention is better than cure;" but that in the earnest belief that danger would result from such construction, I did neither more nor less than my duty in calling the attention of the proper authorities to the subject. However, the embankment has been formed, and, whilst happily no floods have as yet occurred to practically test its effect, it is not too late to take remedial steps to avoid to a great extent the disasters which it may cause by damming back the flood-waters upon Richmond and the low-lying lands adjacent to the city, but more particularly to those who have property on the low grounds of Emerald Hill and Sandridge, should the embankment give way. That it will do so, is almost a certainty, as the materials of which it is constructed would not stand the force of flood-waters, having a velocity due to a gradient of 1 in 1237, or a fall of $4\frac{1}{4}$ feet per mile.

That the Yarra had a velocity due to such a fall is a matter of record, for at the Railway Bridge, Cremorne, when the flood was at its highest in December, 1863, it attained a maximum height of 22.83 feet above the datum level, whilst at Prince's Bridge, a distance of 144 chains lower down the river, it rose to 15.17 feet; thus showing a fall of 7.66 feet in 144 chains, or at the rate of $4\frac{1}{4}$ feet per

mile, and that at a time when the St. Kilda Road was acting as a bye-wash, and allowing more than twice the quantity of water to flow over it that passed under Prince's Bridge. By reference to the flood-levels taken at the time, I find that the sectional area of the water flowing under Prince's Bridge and through the cattle arch amounted at the highest to about 1,700 square feet (this section is between the level of the falls and the highest flood-level at the bridge.) Whilst the sectional area of the flood-waters flowing over the then depression in the St. Kilda Road, between the southern approach of Prince's bridge and the old military barracks, amounted to over 3,500 square feet.

It is, therefore, a waste of time to debate for a moment whether the bridge is a barrier to the floods or not; from these figures the veriest tyro in hydraulic engineering must know, that to stop the relieving action of a byewash or outlet for the flood-waters, by an embankment of earth is a most dangerous experiment, especially when the narrow spans of Prince's Bridge, and the cattle arch are taken into consideration, and compared with the length of the byewash alluded to (820 ft.)

If any argument were necessary to show that the area under Prince's Bridge is too limited for flood-waters, it would be found in the fact, that whilst the height of the flood was 15.17 feet at the bridge, it was only 13.10 feet on the upper side of the Falls, and 11.25 on the lower side; the falls being about 28 chains only from the bridge. This plainly showed that notwithstanding the barrier at the Falls, the flood-water escaped over it, and the adjacent ground so easily, as to reduce the surface level of the water 2.7 feet lower than at the bridge.

Subsequent to my mentioning to the Hon. Mr. Casey about the embankment, that gentleman informed me that since the great flood in '63, the Falls had been lowered, and that no damage from floods need now be apprehended, as there had been a greater rainfall since that date, and that the flood-waters had escaped without approaching anyway near to their former level.

In reply, I admitted that lowering the Falls was a step in the right direction; but I took exception to the statement that there had been a greater rainfall than that in December, 1863. That it might have been greater in some locality of limited area I was not prepared to dispute; but that to imagine there had been a greater rainfall over the

same area was altogether a mistake, and that the comparative heights to which the River Yarra had risen at distances from the City, where it was uninfluenced by either the Falls or Prince's Bridge gave unmistakable proofs that such heavier rainfall could not have been over an area of the water-shed of the Yarra equal to that which occurred in 1863. To verify the statement of the Commissioner I was referred to you, Mr. President, and was also informed that the matter would be brought forward in the House of Assembly. If it were so, I have seen no account of it; but I am credibly informed that since the embankment was erected, the Commissioner has referred the subject to a board of engineers to report upon the probable effect of the embankment on floods; that the said board had sent in a report, in which the embankment as placed was condemned, and which further recommended that a considerable portion of it at both ends should be removed.

It, therefore, appears that the primary objections I urged against its construction have now, *after* it has been made, been endorsed by a board of engineers. This recommendation comes too late to save the waste of public money; but if the difficulty be grappled with at once, it is not too late to avert the consequence of its presence.

When we take into consideration that the immediate cause of floods is the checking by any means, natural or artificial, the free flow of the water into the basin which receives it, whether such basin be river lake or sea, we cannot help coming to the conclusion that Prince's Bridge is one of the artificial barriers that prevent the free escape of the flood-waters of the Upper Yarra, and that the reef upon which it is founded is a natural barrier, the retarding influence of which is not at present so much felt on account of the reef at the Falls being higher than that at the bridge.

My only object in cautioning the Minister of Lands and Agriculture before its construction, and bringing the matter before this Society now when it exists, is simply to prevent as far as possible the danger to property, if not human life, by giving timely warning, and by bringing public opinion to bear upon the question, and to insist upon the embankment being wholly or partially removed with the least possible delay.